

A TRUE INTERNAL PARASITE OF THYSANOPTERA.

BY H. M. RUSSELL.

In view of the recent interest manifested in the order Thysanoptera and the tremendous importance several species of this group have assumed economically, it is of interest to record, at this time, the rearing of a parasite from a number of different species of thrips. At Compton, California, on December 10, 1910, four specimens of the prepupal stage of *Heliethrips fasciatus* Perg. gave unmistakable signs of parasitism. These were among a lot that had been collected in the larval stage on November 10, 1910, in order to ascertain how this thrips passes the winter, and this lot comprised the last that the writer was able to find that fall. By December 13, two of these prepupæ had been killed, while from the others parasitic larvæ had emerged and changed to naked pupæ. These were sent to the Bureau of Entomology of the U. S. Department of Agriculture, in the hope that the adult could be reared and determined, but unfortunately both died and this was impossible. As soon as the weather permitted, the author again took up the work of collecting the larval form of this thrips, in order to rear the parasite. Although this work was begun in February, 1911, it was not until June 15 that any parasitized specimens were found. Then a collection of four larval forms was made at Compton, California, one of which was parasitized. On July 3, 1911, one prepupa showed plainly that it was parasitized, but died without changing to pupa.

While collecting thrips material at Hollywood, California, on June 29, the author observed a very minute hymenopteron on the under side of a bean leaf in company with larvæ of *Heliethrips fasciatus* and, impressed with the idea that this was the parasite of the thrips, it was carefully watched through a small hand lens and appeared to oviposit once in a thrips larva. After this, the insect was not again observed to come in contact with thrips larva, so it was very carefully captured and put in 50 per cent alcohol. Later it was sent to the Bureau of Entomology in Washington and determined to be one of the Tetrastichinæ. Because of the minute size of this insect it was at once evident that it must be reared from the thrips themselves to bear out the doubtful case of oviposition noted. Therefore it was a source of great gratification to the writer to successfully rear this parasite July 29, from material collected at Hollywood on June 29. This insect is described as a new genus and species on page 233 of these Proceedings by Mr. J. C. Crawford, of the United States National

Museum, under the name *Thripoctenus russelli*. The following is a brief summary of the life history and habits of this insect as observed by the writer and his assistant, Mr. J. E. Graf. It may also be added that every important fact discovered concerning this insect has been independently observed and checked up by either the writer or Mr. Graf.

This parasitism first becomes evident two or three days after the thrips larvæ have changed to the prepupal stage and often after the normal insects have further changed to the pupal stage. The first indication is an extracting of color from the antennæ, head, and anal end of the thrips, leaving these hyaline, and an evidence of a deepening color in the center of the body. The attacked insect still has the power of motion, but as the feeding continues the color is more and more drawn to the center of the host and the edges of the body begin to appear hyaline, then the limbs collapse and sprawl in all directions, and the thrips loses all power of motion. Within a few hours after the parasitism is first noticed the insect has become shortened and more rounded and entirely hyaline or colorless, with the exception of an inner cylinder of deep crimson color in *Heliethrips fasciatus* or yellow in *Thrips tabaci* Lind. or *Euthrips tritici* Fitch. The parasitic larvæ emerge and pupate within from 2 to 11 days after the parasitism becomes evident, but, in over 66 per cent of the cases observed, in from 3 to 4 days. When the parasite is ready to pupate, the skin of the host is split and gradually worked off at the anal extremity and the parasite pupates in front of this cast skin, in whatever location the host had sought to change to a pupa.¹ The pupa is more or less of a flattened oval, 0.78 to 0.85 mm. in length and 0.30 to 0.32 mm. in width at the shoulders. The head is rounded in front and is followed by a distinct neck behind which the body is abruptly widened to its fullest extent. Posterior to this the sides, at first more or less parallel, converge very evenly to the posterior extremity. The newly formed pupa is almost white, except for the crimson cylinder in the center of the body, but in a short time it becomes gradually darker until it changes to shining black. During the summer the pupal stage varied in length from 16 to 28 days, but over 66 per cent of the specimens reared completed this stage in from 17 to 20 days.

The adult in emerging breaks off the covering of the face and splits the pupa case down the back, after which it frees its fore legs and by means of these slowly pushes the case

¹ *H. fasciatus* in some cases pupates in a curled-up leaf, but more often has been observed in rubbish or in cracks or under lumps of earth.

from the body. In a short time the adult begins to crawl over the foliage in search of host insects. Up to the present time every one of the many hundreds of adults reared have been females and these have reproduced parthenogenetically in all cases observed. In fact, at the present writing two generations have been reared from an unfertilized female.

The live adult is a beautiful little creature, about 0.60 to 0.75 mm. in length, having a black head, bluish black thorax, and hyaline wings; the antennæ, legs, and abdomen are light yellow; the posterior part of the abdomen more or less blackish.

The female parasite, while flying readily when disturbed, on most occasions, crawls over the surface of the leaf very slowly and deliberately or at other times with astounding speed, the antennæ in constant motion, first turned to one side and then to the other. When a thrips larva is encountered the hymenopteron stops, then very gently strokes it from end to end with her antennæ, and, if satisfied, she bends the abdomen under her body and exserts an extremely long and slender ovipositor. This is deliberately thrust into the body of the thrips larva and in most cases into the side of the abdomen. Generally this process occupies only a few seconds and then the search is continued for other larvæ, or in a few cases she returns to the same larva and oviposits in it for the second or third time.

Up to the present writing this insect has been reared in the laboratory from its original host, *Heliothrips fasciatus*, from *Thrips tabaci* (the onion thrips), and from *Euthrips tritici* (the wheat thrips). Field collections, this past summer (1911), have shown it to be breeding extensively in the onion thrips and bean thrips (*Heliothrips fasciatus*), the parasitism in some cases running as high as 70 per cent. The greatest number of adults reared from the eggs deposited by a single female so far has been 91 specimens.

The time from the laying of the egg until the parasitism is indicated in the host prepupa varies from 6 to 15 days, but is 7 days in the greater number of cases. The time required from oviposition to the pupation of the parasite varies from 8 days in the case of a very few, to 24 days in a few cases, but over 56 per cent change in from 10 to 14 days. The whole life cycle, then, requires from 28 to 48 days, with a mean average temperature of about 65°F. The winter is undoubtedly passed in the pupa stage, but the writer hopes to settle this point definitely during the coming winter.

At present this parasite is known to occur at Compton, Whittier, Puente, and Hollywood, all situated in Los Angeles County, California, and making up an area of nearly 150 square miles. As an example of its abundance, Mr. Graf,

while recently at Puente, counted between 40 and 50 adults on a single plant of *Nicotiana glauca* infested by the bean thrips and it is now almost impossible to collect *Heliethrips fasciatus* at Compton, where this parasite was first discovered.

A TENDENCY TOWARDS POSTERIOR ERYTHRIZATION IN THE PSAMMOCHARIDÆ.

(Hymenoptera.)

BY NATHAN BANKS.

Recently in examining some of our psammocharid wasps I noticed that there were forms that were practically mutants of the typical form of the species, and that in all cases this mutant was distinguished by having more red on the hind legs or abdomen than in the normal form of the species. I exhibit seven examples of this in six genera.

(1) *Psammochares fuscipennis*, and a mutant, var. *georgiana*, which has the abdomen all red and the hind legs reddish.

(2) *Aporinellus fasciatus*, a common black species, and a form, *A. ferruginipes*, with reddish legs.

(3) *Ceropales bipunctata*, which normally has hind femora red, and a variety (*tibialis*) in which the hind tibiæ are also reddish.

(4) *Pseudagenia mexicana*, which typically has black coxæ, and a variety (*flavicoxæ*) in which the coxæ are yellowish red.

(5) *Pseudagenia mellipes*, with normally black coxæ, and a variety (*adjuncta*) with the coxæ II and III reddish.

(6) *Episyron atrytone*, all black, and a species almost exactly the same, except with reddish hind femora (*E. posterus*).

(7) *Batazonus algidus*, with black legs, and a variety with reddish legs.

These are not examples of extremes of variation; I have seen several of each, always alike, and without gradations. The species or varieties differ from each other in scarcely any character except this increase of red; therefore it seems evident that in this family there is a tendency to produce mutants with more red posteriorly than in the typical form.

I have not noticed such a form of mutation in any other group, although doubtless there are such.

Various spiders that in the East are green become more or less marked with red in the West, but the amount of red is extremely variable.

These mutants of the Psammocharidæ all come from the South, while the typical form occurs much farther north, as well as in the South.